(12) UK Patent Application (19) GB (11) 2 347 730 (13) A

(43) Date of A Publication 13.09.2000

(21) Application No 9926151.3

(22) Date of Filing 05.11.1999

(30) Priority Data
(31) 19911113 (32) 12.03.1999 (33) DE

(51) INT CL[7]
F16D 3/224

(52) UK CL (Edition R)
F2U U532 U534

(56) Documents Cited
GB 2331572 A GB 2295440 A EP 0463531 A1

(58) Field of Search
UK CL (Edition R) F2U
INT CL[7] F16D 3/20 3/22 3/223 3/224 3/226
Online: WPI EPODOC PAJ TXTUS1 TXTUS2 TXTEP1 TXTGB1 TXTWO1

(71) Applicant(s)
GKN Löbro GmbH
(Incorporated in the Federal Republic of Germany)
Carl-Legien-Strasse 10, D-63073 Offenbach,
Federal Republic of Germany

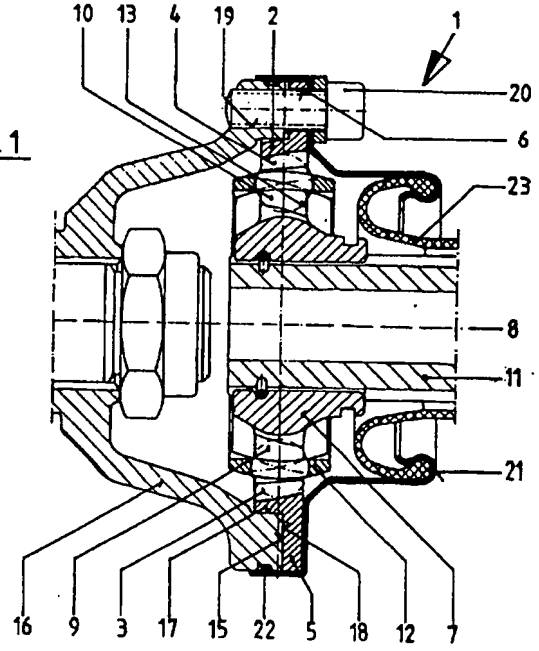
(72) Inventor(s)
Werner Jacob

(74) Agent and/or Address for Service
Forrester Ketley & Co
Chamberlain House, Paradise Place, BIRMINGHAM,
B3 3HP, United Kingdom

(54) Abstract Title
Assembly of a constant velocity joint and a receiving part.

(57) The constant velocity joint 1 comprises inner part 7, cage 12, guiding balls 13 and plate metal outer part 2 having alternating running grooves 3,4 and a flange 5 with through bores 6 for receiving bolts 20 to attach the outer part to receiving part 16. The outer face of the outer part has a continuous (114 Fig. 6) or intermittent (14 Fig. 3) cylindrical centring face received in centring bore 17 of the receiving part. Plate metal cap 21 is retained by the bolts near the flange and seals 22 against the receiving part, its free end attaches a convoluted boot for joint sealing. An intermediate ring (24 Fig. 5) may lie between the flange and the receiving part for vibration damping. The plate outer part is supported by the flange and receiving part when transmitting torque.

Fig.1



GB 2 347 730 A

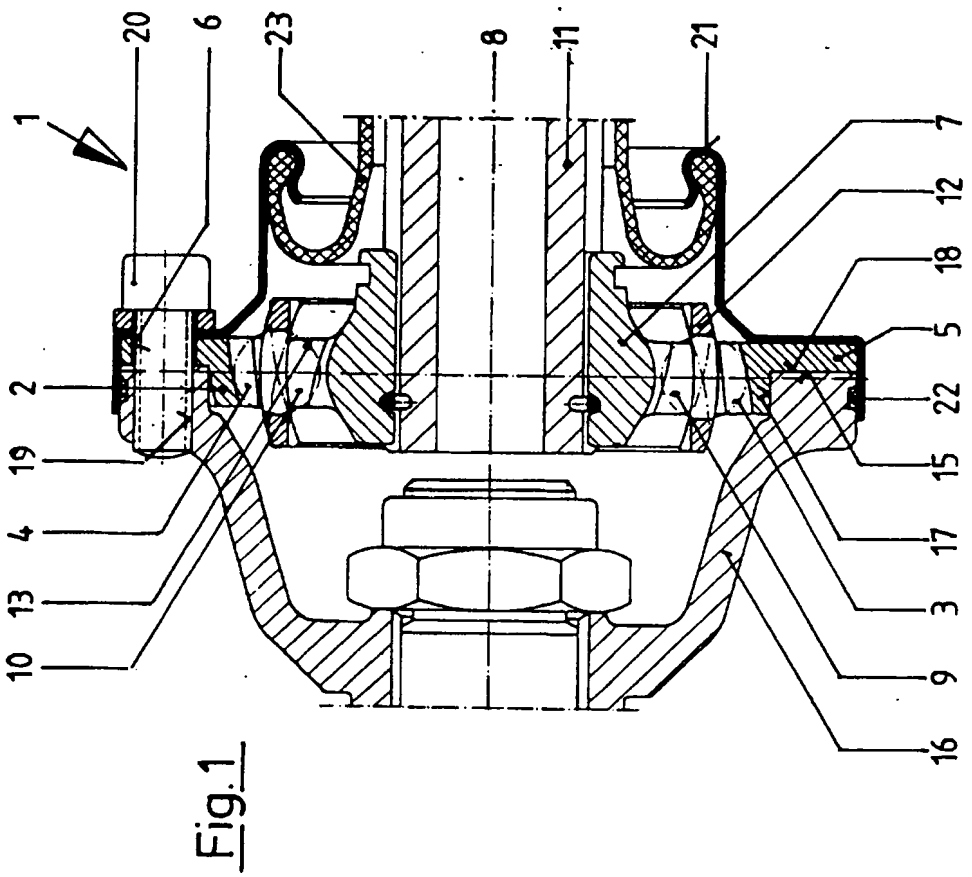


Fig.1

Fig.2

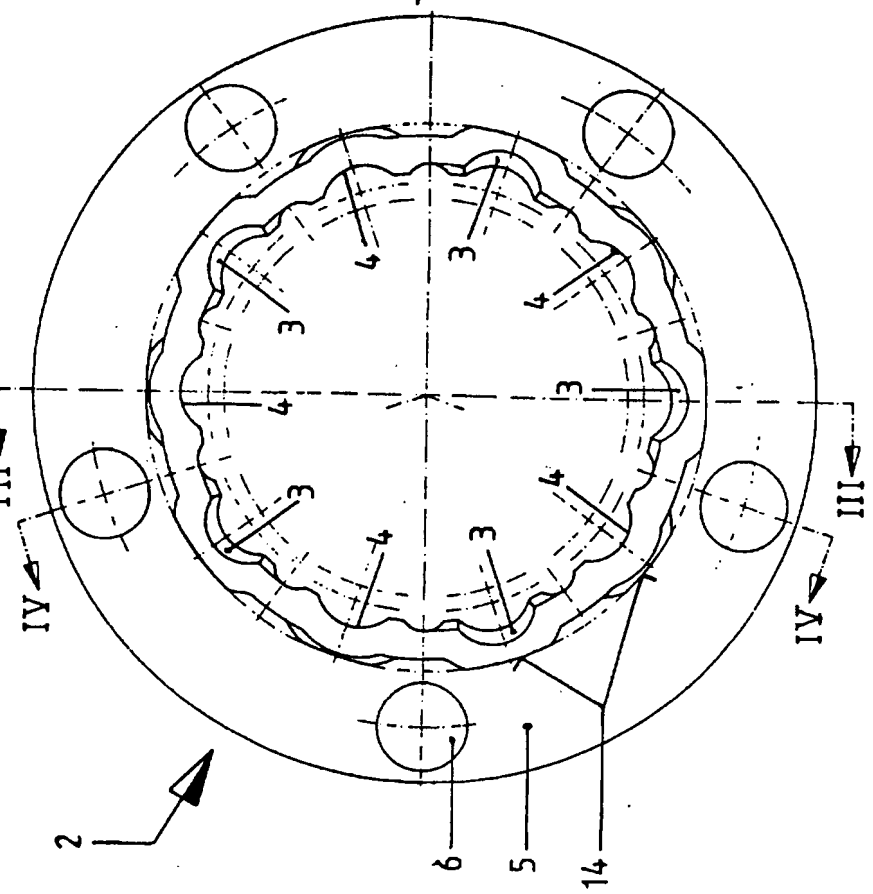


Fig.4

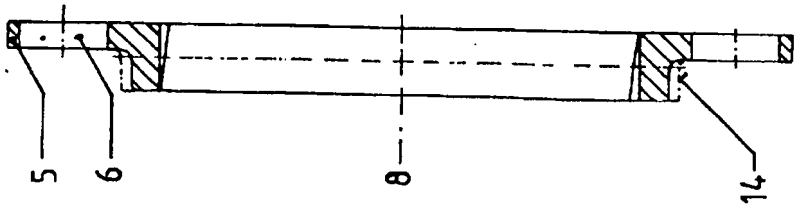


Fig.3

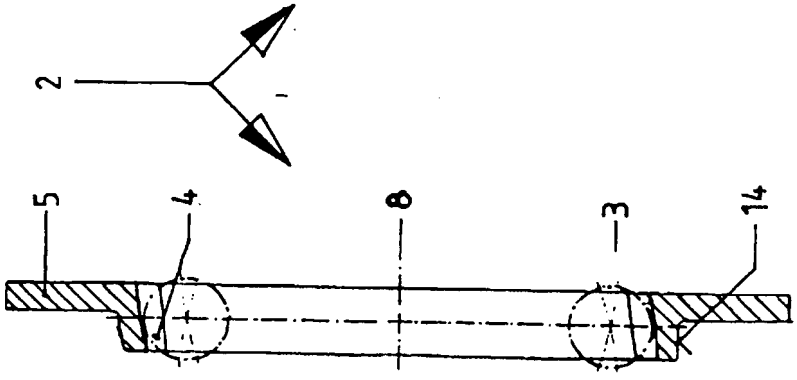


Fig. 5

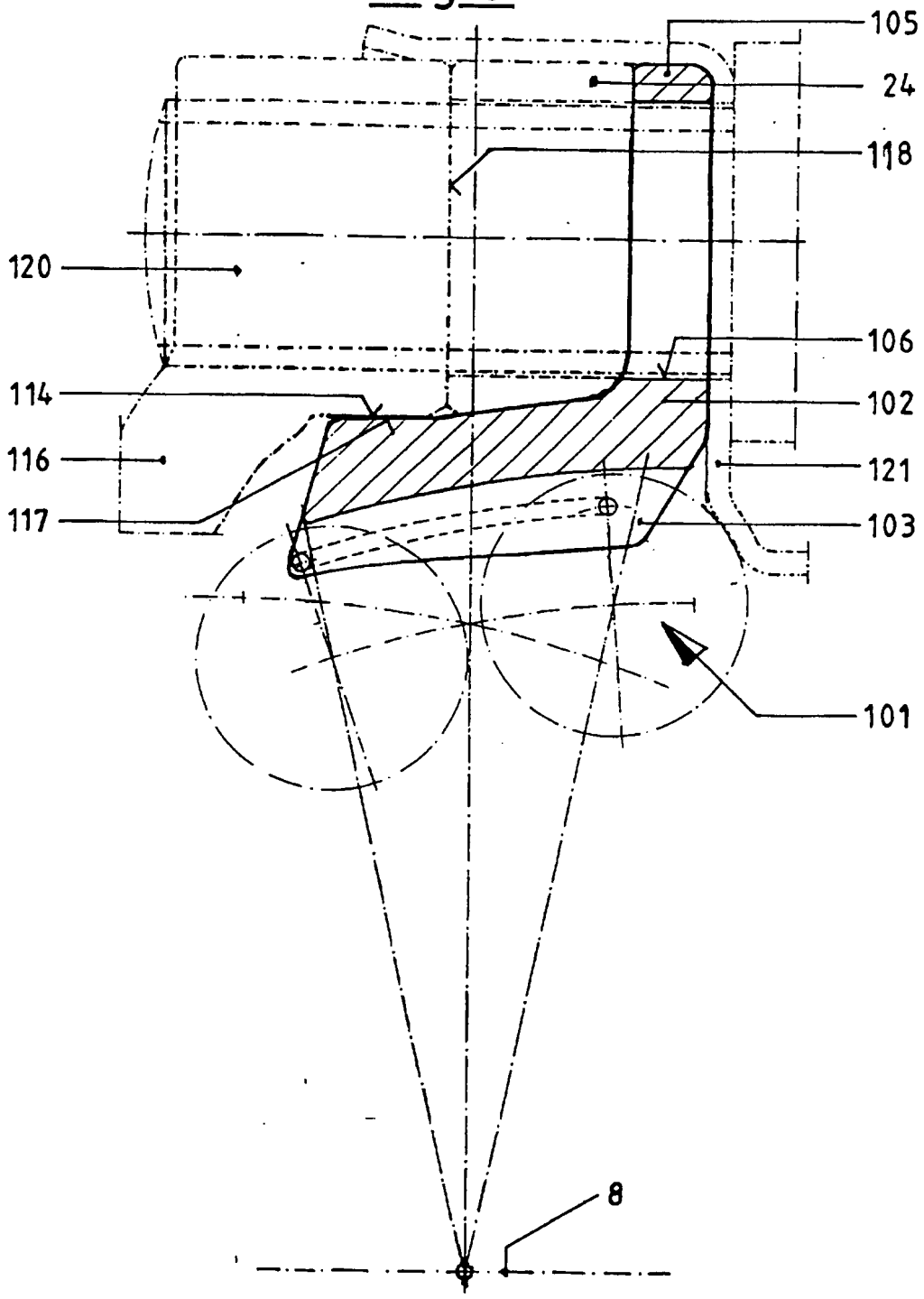


Fig. 8

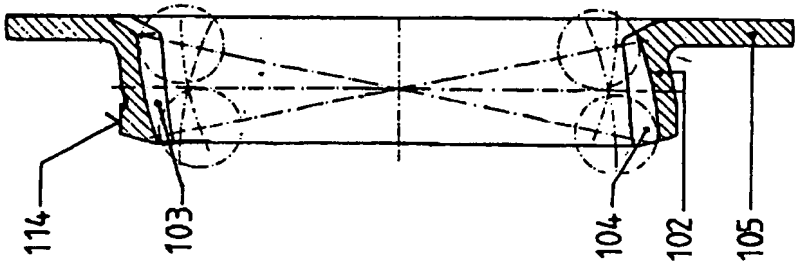


Fig. 7

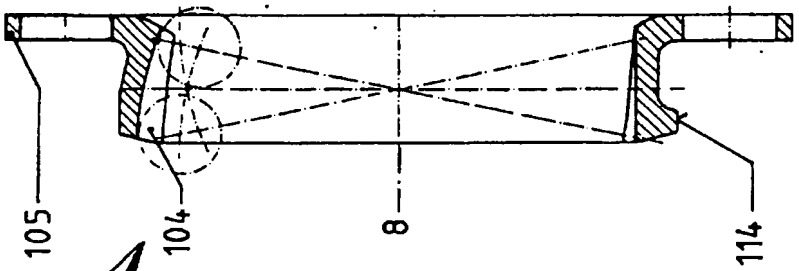
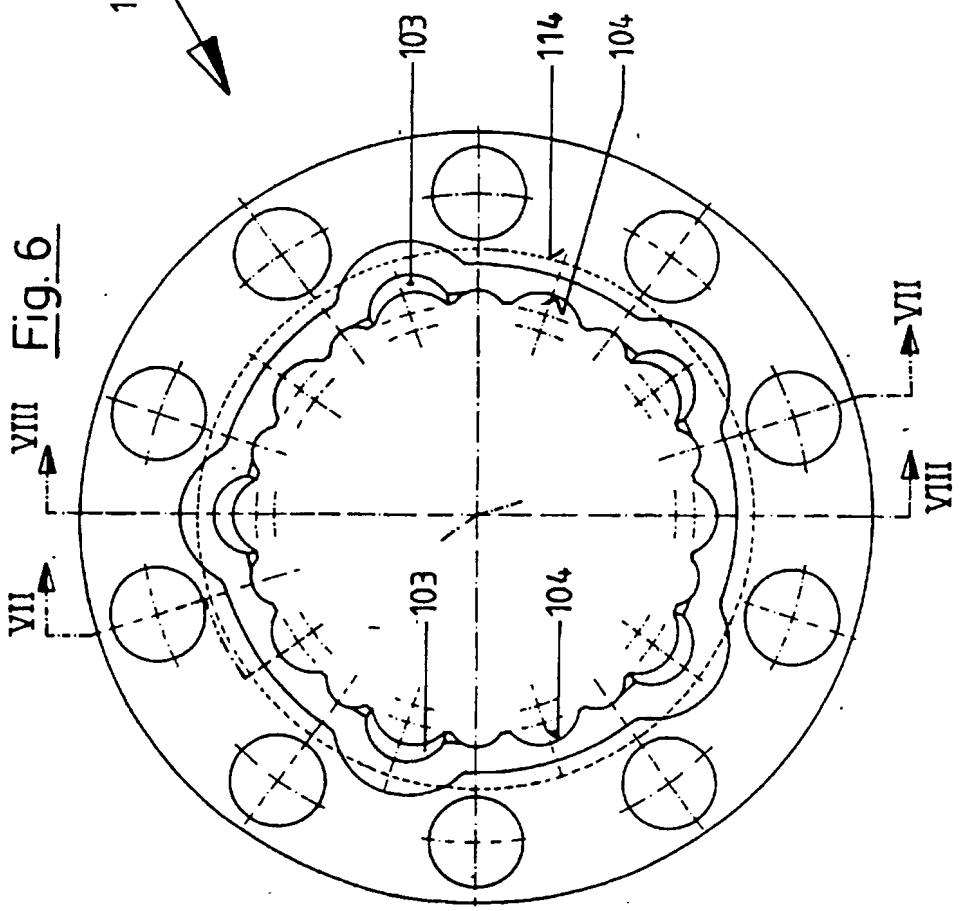


Fig. 6



2347730

PATENTS ACT 1977

A9912GB-GMD

Title: Assembly Having a Constant Velocity Joint and a Receiving Part

Description of Invention

This invention relates to an assembly which comprises a constant velocity joint and a receiving part. The receiving part serves to receive an outer part of the constant velocity joint.

DE-4042390-C2 describes a constant velocity joint with an outer part which is produced as a solid formed part and is approximately annular in shape. The annular cage of the joint comprises a hollow spherical inner face. The cage is axially slotted, so that it can be mounted on the spherical outer face of the inner joint part. Furthermore, the cage comprises a spherical outer face which is enclosed by hollow spherical partial faces of the outer part, whilst for mounting purposes, the outer part is axially divided into two annular parts. After the inner part, cage and outer part have been assembled, the unit is inserted into a receiving part which encloses the outer face of the outer part. A rotationally fast connection between the outer part and the receiving part is achieved by virtue of the fact that the receiving part is formed into recesses in the outer face of the outer part. There is thus obtained a positive, form-fitting connection.

It is the object of the invention to provide an assembly having a constant velocity joint and a receiving part, which assembly permits a lightweight design of the constant velocity joint.

In accordance with the invention, we provide an assembly of a constant velocity joint and a receiving part, the joint comprising an outer joint part which is axially open at both ends, an inner joint part, a cage and balls, the outer part and the inner part being provided with running grooves for receiving the balls and the cage serving to guide said balls, wherein the outer joint part is

formed of plate metal and, at one axial end, comprises a formed-on flange and, towards the other axial end, on its outside, is provided with an at least partially cylindrical centring face, the flange being provided with through-bores for fixing bolts; and wherein the receiving part comprises a cylindrical centring bore for centeringly receiving the centring face of the outer joint part, and threaded bores which are arranged to correspond to the through-bores of the flange, with the fixing bolts being engageable with the threaded bores of the receiving part.

The advantage of the above embodiment is that the outer part can be formed from plate (sheet) metal in a non-chip producing way. The dimensional stability is ensured at one axial end by the flange and, at the other axial end, by the receiving part engaging the outer part in a centred way, so that even if the constant velocity joint is subjected to high loads when under torque or when operating at an angle, deformation of the outer part occurs to an acceptable extent only. Because it is possible to use a formed plate metal part, material utilisation can take place to a greater extent than this is normally the case with solid components.

The centring face of the outer part can be provided in the form of an uninterrupted cylindrical face. However, it can also be interrupted in the circumferential direction. This means that there are obtained partial centring faces which, in the case of a constant velocity joint with a plate metal outer part, may be provided in the outwardly curved regions of those portions which contain the outer running grooves. To achieve an uninterrupted centring face, it is possible to provide upset webs on the side facing away from the flange, in the regions between circumferentially adjoining outwardly curved portions containing the outer running grooves. The centring face can axially extend in portions along the entire length between the flange and the axial end facing away from the flange, but it can also be concentrated on only some regions along a short part of the length, in the region of the end facing away from the

flange. This is always advantageous in those cases where upsetting takes place in the region between two circumferentially adjoining outer running grooves.

In a preferred embodiment, the flange can be held tensioned against a contact face of the receiving part. It is possible to arrange an intermediate ring between the flange and the contact face. The intermediate ring can be used for damping vibrations for example.

Furthermore, the receiving part can be used to close the axial end of the outer part which is remote from the flange. Accordingly it is proposed in accordance with the invention there may be provided a cap which axially covers the outside of the flange and axially extends over part of the outer face of the receiving part. Between the portion covering the receiving part and the receiving part, there may be provided a seal. Furthermore, the cap may be used to attach a convoluted boot which serves to seal the constant velocity joint relative to a shaft connected to the inner part of the constant velocity joint.

Two preferred embodiments of the invention are diagrammatically illustrated in the drawings, wherein:

Figure 1 is a longitudinal section through a first embodiment which comprises a constant velocity joint with an outer part formed of plate metal, and a receiving part;

Figure 2 is a plan view of the outer part at the flange end, shown as an individual component in an enlarged scale;

Figure 3 is a section on III-III of Figure 2;

Figure 4 is a section on IV-IV of Figure 2;

Figure 5 is half a longitudinal section, in an enlarged scale, through an outer part associated with a receiving part, with an intermediate ring being arranged between the flange of the outer part and the contact face of the receiving part and with the centring face extending continuously;

Figure 6 is a plan view of an outer part in a second embodiment in the direction of the flange;

Figure 7 is a section on VII-VII of Figure 6;

Figure 8 is a section on VIII-VIII of Figure 6.

Figure 1 is a longitudinal section through a constant velocity joint 1 having an outer part 2 which is produced from a plate metal material (steel plate) by a non-chip producing forming operation and which comprises first outer running grooves 3 which start from a first axial end provided with the flange 5 and whose track base approaches the longitudinal axis 8 in the direction of the other axial end which is remote from the flange 5. Furthermore, the outer part 2 comprises second outer running grooves 4 which are shown in dashed lines only and which start from the second axial end remote from the flange 5. The track base of said second outer running grooves 4 approaches the longitudinal axis 8 in the direction of the first axial end associated with the flange 5. The flange 5 comprises circumferentially distributed through-bores 6. The inner part 7 is received in the outer part 2. The inner part 7, in its outer face, comprises first inner running grooves 9 and second inner running grooves 10 which are alternately circumferentially arranged around the longitudinal axis 8, with the first inner running grooves 9 being arranged opposite the first outer running grooves 3 and with the second inner running grooves 10 being arranged opposite the second outer running grooves 4. The track base of the first inner running grooves 9 starts from the first axial end adjoining the flange 5 and extends towards the second axial end which is removed from the flange 5, while approaching the longitudinal axis 8. The course taken by the second inner running grooves 10 is reversed accordingly. A shaft 11 is inserted in a rotationally fast way into a central bore of the inner part 7, which bore is centred on the longitudinal axis 8. Between the outer part 2 and the inner part 7, there is arranged a cage 12. The cage 12 comprises windows which hold respective balls 13. The latter engage respective opposed pairs of outer running grooves 3, 4 and inner running grooves 9, 10. Furthermore, the outer part 2 comprises a centring face 14

which is formed of a plurality of individual face parts, as will be explained in greater detail in connection with Figures 2 to 4. By means of its centring face 14, the outer part 2 is received in a centred way in a cylindrical centring bore 17 of a receiving part 16 on the longitudinal axis 8. In addition, the outer part 2, by means of its flange face 15, rests against the contact face 18 of the receiving part 16. The outer part 2 is tensioned by means of the fixing bolts 20 which are inserted through the through-bores 6 and threaded into correspondingly arranged threaded bores 19 of the receiving part 16. The receiving part 16 covers the second axial open end of the outer part 2. The receiving part 16 can be connected to a journal for example which projects from a drive, for example the axle differential of a motor vehicle. Furthermore, there is provided a cap 21 which can be a plate metal part and which comprises an outer portion which extends over the outside of the flange 5, including the outer face of the receiving part 16. For sealing purposes, a seal 22 is arranged between said region of the cap 21 and the outer face of the receiving part 16; said seal 22 is positioned in a groove of the receiving part 16. The cap 21 is also secured by the fixing bolts 20. Furthermore, the free end of the cap, which extends away from the flange 5, serves for attaching a convoluted boot 23 whose other end is secured to the shaft 11, so that the interior of the constant velocity joint 1 is sealed.

Figures 2 to 4 show the outer part 2 as an individual component. It is possible to see the first outer running grooves 3 and second outer running grooves 4 which are formed into the outer part 2 and which are alternately arranged around its circumference, so that this region comprises outwardly curved formations. The outer faces of said formations form part-cylindrical portions of the cylindrical centring face 14 by means of which the outer part 2 is received in the receiving part 16. The centring face 14 is thus interrupted on its circumference. Furthermore, it can be seen that there is provided a total of five through-bores 6 for passing through fixing bolts.

Figures 5 to 8 show an embodiment which is modified as compared to that shown in Figures 1 to 4. Those parts which correspond to parts of embodiments illustrated in Figures 1 to 4, have been given reference numbers which have been increased by 100 as compared to the corresponding parts in Figures 1 to 4. As far as those parts are concerned, reference is also made to the description of the embodiment according to Figures 1 to 4. However, the deviations will be explained in greater detail below. Figure 5 only shows half a section of the constant velocity joint 101; there is only shown the outer part 102, but not the further components associated with the constant velocity joint 101. There is provided a receiving part 116 which comprises a cylindrical centring bore 117 in which the outer part 102, which is also a formed plate metal part, is received by means of its outer, but continuous cylindrical centring face 114. Between the flange 105 of the outer part 102 and the contact face 118 of the receiving part 116, there is inserted an intermediate ring 24 for damping vibrations. The fixing bolts 120 also pass through said intermediate ring 24. Part of the cap 121 is also shown.

The design of the outer part 102 is shown in greater detail in Figures 6 to 8. It can be seen that there is provided a continuous centring face 114 which is not interrupted in the circumferential direction, but it is discontinued in the direction of the longitudinal axis 8. Only the circumferentially alternating first outer running grooves 103 and second outer running grooves 104 can be seen, and between two circumferentially adjoining second outer running grooves and, respectively, between the outwardly curved formations resulting from the deformation of the wall, there are arranged rib-shaped projections which are produced by upsetting and which, on their outer face, contain the centring face 114 which thus extends continuously all around the circumference of the outer part 102 at the second axial end, i.e. the end remote from the flange 105. The centring face 114 extends in the direction of the longitudinal axis 8, but only over part of the length between the flange 105 and the second axial end of the

outer part 102 containing the outer running grooves 103, 104, which second axial end is remote from the flange 105.

In the present specification "comprise" means "includes or consists of" and "comprising" means "including or consisting of".

The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

CLAIMS

1. An assembly of a constant velocity joint and a receiving part, the joint comprising an outer joint part which is axially open at both ends, an inner joint part, a cage and balls, the outer part and the inner part being provided with running grooves for receiving the balls and the cage serving to guide said balls, wherein the outer joint part is formed of plate metal and, at one axial end, comprises a formed-on flange and, towards the other axial end, on its outside, is provided with an at least partially cylindrical centring face, the flange being provided with through-bores for fixing bolts; and wherein the receiving part comprises a cylindrical centring bore for centeringly receiving the centring face of the outer joint part, and threaded bores which are arranged to correspond to the through-bores of the flange, with the fixing bolts being engageable with the threaded bores of the receiving part.

2. An assembly according to Claim 1, wherein the centring face is circumferentially interrupted.

3. An assembly according to Claim 1 or Claim 2 wherein the flange can be held tensioned against a contact face of the receiving part.

4. An assembly according to Claim 3, wherein an intermediate ring is arranged between the flange and the contact face.

5. An assembly according to any one of the preceding claims, wherein the receiving part closes the axial end of the outer part which is remote from the flange.

6. An assembly according to any one of the preceding claims, wherein there is provided a cap which axially covers the outside of the flange and axially extends over part of the outer face of the receiving part; between that part of the cap which covers the receiving part and the receiving part, there is arranged a seal; and the cap further serves for attaching a boot for sealing the constant velocity joint relative to a shaft connected to the inner part of the constant velocity joint.

7. An assembly substantially as hereinbefore described with reference to Figures 1-4 or Figures 5-8 of the accompanying drawings.

8. Any novel feature or novel combination of features described herein and/or in the accompanying drawings.

Amendments to the claims have been filed as follows

CLAIMS

1. An assembly of a constant velocity joint and a receiving part, the joint comprising an outer joint part which is axially open at both ends, an inner joint part, a cage and balls, the outer part and the inner part being provided with running grooves for receiving the balls and the cage serving to guide said balls, wherein the outer joint part is formed of plate metal and, at one axial end, is formed as a flange and, towards the other axial end, on its outside, is provided with an at least partially cylindrical centring face, the flange being provided with through-bores for fixing bolts; and wherein the receiving part comprises a cylindrical centring bore for centeringly receiving the centring face of the outer joint part, and threaded bores which are arranged to correspond to the through-bores of the flange, with the fixing bolts being engageable with the threaded bores of the receiving part.

2. An assembly according to Claim 1, wherein the centring face is circumferentially interrupted.

3. An assembly according to Claim 1 or Claim 2 wherein the flange can be held tensioned against a contact face of the receiving part.

4. An assembly according to Claim 3, wherein an intermediate ring is arranged between the flange and the contact face.

5. An assembly according to any one of the preceding claims, wherein the receiving part closes the axial end of the outer part which is remote from the flange.

6. An assembly according to any one of the preceding claims, wherein there is provided a cap which axially covers the outside of the flange and axially extends over part of an outer face of the receiving part; between that part of the cap which covers the receiving part and the receiving part, there is arranged a seal; and the cap further serves for attaching a boot for sealing the constant velocity joint relative to a shaft connected to the inner part of the constant velocity joint.

7. An assembly substantially as hereinbefore described with reference to Figures 1-4 or Figures 5-8 of the accompanying drawings.

Application No: GB 9926151.3 **Examiner:** J. C. Barnes-Paddock
Claims searched: 1-7 **Date of search:** 14 January 2000

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): F2U

Int Cl (Ed.7): F16D 3/20, 22,223,224,226

Other: Online: WPI, EPODOC PAJ, TXTUS1, TXTUS2, TXTEP1, TXTGB1, TXTWO1

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A P	GB 2 331 572 A	(GKN LÖBRO) See Figure 1, note surfaces 11. Sheet metal outer part with flange and cylindrical surface.	
A	GB 2 295 440 A	(LÖHR) See Figure 1. Sheet metal outer part with flange.	
A	EP 0 463 531 A1	(TOYODA) See Figure 1 - axial projections at top/bottom of figure. A universal joint outer member bolted to a retainer with centring surfaces.	

X Document indicating lack of novelty or inventive step
Y Document indicating lack of inventive step if combined with one or more other documents of same category.
& Member of the same patent family
A Document indicating technological background and/or state of the art.
P Document published on or after the declared priority date but before the filing date of this invention.
E Patent document published on or after, but with priority date earlier than, the filing date of this application.